U.S. ARMY CORPS OF ENGINEERS

SACRAMENTO DISTRICT

ENGINEERING DIVISION

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QUALITY MANUAL

Title: Engineering Quality Manual					
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Changes to this document require the concurrence of the Management Representative and approval by the Chief, Engineering Division, and shall follow the procedures described in *Engineering Quality Procedure (EQP) 5-01, Procedure for the Preparation and Administration of Procedures.*

Revision Table

Effective Date	Issue	Revision	Description of Revisions
31 May 2000	1	0	Original release.

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1.0 INTRODUCTION

1.1 General

The U.S. Army Corps of Engineers, Sacramento District, is responsible for executing Civil Works, Military, Hazardous, Toxic and Radioactive Waste (HTRW) and Support for Others/Work for Others (SFO/WFO) programs. The District's Engineering Division (ED) provides a full range of professional engineering, architectural, and environmental services for the planning, design, remediation, construction support, and operational guidance for government, commercial, industrial, military and water resources projects, and for readiness/disaster response missions.

General products, services, and types of projects. Engineering creates design service solutions to meet customer needs of cost, form, fit, and function by analyzing requirements, investigating technology and options, and developing designs, plans and specifications that meet customer expectations. Products and services include engineering analysis, technical reports, technical consultation, cost estimates, value engineering, plans, specifications, peer reviews, contracts, and construction support. Both In-house value engineering and A-E capability is available.

Civil Works. Engineering services for investigating and solving flood control and water-related civil works needs, including resource management, technical services, landscape architecture, civil design, structural engineering, geotechnical engineering, hydraulics and hydrologic engineering, flood forecasting, water management (incl. reservoir control), dam safety, and disaster response capability. Projects for states, local agencies, SFO (incl. hydropower retrofit) and WFO typically include flood control structures such as levees, channels, dams, as well as dredging projects, harbors, and wetland restoration. Environmental mitigation requirements are incorporated into all project designs.

HTRW. Engineering services for environmental restoration, compliance and pollution prevention including planning, investigation, assessment, design, remediation, monitoring and operation to protect human health and the environment for Defense Environmental Restoration Program (DERP), Installation Restoration Program (IRP) and Formerly Used Defense Sites (FUDS), Base Realignment and Closure (BRAC), Environmental Compliance Assessment Systems (ECAS), military and civil works HTRW, Environmental Protection Agency (EPA) Superfund, and SFO/WFO projects. Community outreach, regulator coordination/partnering, fast start capability, and one-stop services are capabilities often employed in the projects.

Military Design. Engineering services include design, technical studies and consultation, technical services and resource management, construction support, Automated Review Management System (ARMS) Technical Center of Expertise (TCX), base master planning, Geographic Information Systems (GIS), mobilization master planning, Western TCX for Family Housing, COS for Brigade & Battalion HQTRS, installation maintenance and repair, mobilization, 1391 preparation, and Operation and Maintenance (O&M) manuals. Typical projects include buildings, pavements, O&M, water wells and infrastructure for Army, Air Force, other armed services, and similar work for SFO and WFO clients.

1.2 Vision Statement

Sacramento District is dedicated to continuing its quest for quality performance, to be responsive to our customers and pursuit of customer satisfaction.

The HQUSACE Internet home page at http://www.usace.army.mil/strategic presents the Command Strategic Planning, vision statement, campaign plan, master strategy and innovations for the Corps. The South Pacific Division (SPD) Regional Project Management Business Process (RPMBP) at

http://corpsnet.spk.usace.army.mil/rpmbp and Sacramento District Business Plan at http://corpsnet/cespk-de-r/main.html establish common project management processes to assure successful project delivery to our customers.

ED fully supports the vision statement and strategies of HQUSACE and has incorporated them into the Quality Manual where appropriate. ED will continue to improve our business processes and philosophy based on the HQ strategies, RPMBP and business plan.

Due to the need to continuously improve customer responsiveness and satisfaction, to grow in overall quality of performance, and to better posture ED to carry out the Corps Vision, ED management has decided to establish a Quality Management System (QMS) that complies with the internationally recognized standard ISO 9001.

2.0 ADMINISTRATION OF THE ED QUALITY MANUAL

The content of this quality manual and of supporting documents is applicable to all ED employees and shall be observed and implemented by all personnel as applicable to their activities. No deviation is permitted without the express permission of the Management Representative.

The ED Management Representative is vested with full responsibility for the proper and timely implementation of the QMS, together with the appropriate level of authority for ensuring its continuing effectiveness. This manual, as well as the entire ED QMS, will be reviewed quarterly as a minimum. Preparation, revision and administration of this Quality Manual is accomplished in accordance with *EQP 5-01, Procedure for the Preparation and Administration of Procedures*. The current issue number, revision number, and date are shown on this manual and on the Master List of Procedures. The Quality Manual is found on the District Engineering ISO 9000 home page at http://www.iso9000.spk.usace.army.mil/ and includes all EQPs and other documents.

3.0 HIERARCHY OF QMS DOCUMENTATION

The structure of the QMS documentation is outlined and described in Paragraph 4.2.1. This Quality Manual is designed to identify the hierarchy of documentation in the QMS.

4.0 QMS REQUIREMENTS

The following twenty sections describe the ED QMS requirements.

Section 1
Management Responsibility

Our Division maintains an organization structure that defines responsibilities, authority, and lines of communications for areas that affect product and service quality. Accountability and responsibility for quality rest with all Engineering Division employees. Our responsibilities include:

- Set priorities.
- Provide required resources.
- Develop and monitor key performance measures.
- Direct corrective/preventive actions.
- Evaluate system effectiveness.

4.1 Management Responsibility

This section describes management responsibilities for the ED QMS, including quality policy and objectives, and organizational roles and authorities, resources, management quality representatives, and management review.

4.1.1 Quality Policy

ED's quality policy is contained in the Quality Policy Statement (Appendix 2). Specific Performance Measures and Objectives are contained in the Performance Measures – Objectives (Appendix 3). Both documents are displayed on the ISO 9000 home page and in each section throughout ED. Understanding and implementing the ED quality policy and Performance Measures – Objectives are accomplished through the publication of the documented QMS. ED management staff will also communicate the quality policy, Performance Measures and Objectives by inclusion of appropriate QMS expectations and actions in TAPES objectives, and through the induction routines employed in training new employees *(see Section 18)*.

4.1.2 Organization

4.1.2.1 Responsibility and Authority

The Organization and Position Charts, maintained by Resource Management Office, define lines of responsibility of all management personnel. These charts are updated annually and when necessary due to reorganization, by Resource Management Office. ED's management personnel include the Chief, Special Assistant to the Chief, Branch Chiefs, and Section Chiefs. Division, Branch, and Section organization, mission and function statements are found in CESPK OM 10-1-3, "Organization, Mission and Functions." This OM is reviewed and revised biannually, and as needed, by the Division Chief, and the appropriate Branch or Section Chief. Quality roles, responsibilities and authorities are reviewed annually in the QMS management review meetings (*EQP 1-01, Management Review*), and as needed. Responsibilities for each team member are included in individual job descriptions and annual TAPES performance goals. Authority levels of ED staff are addressed in an Authority Matrix (Appendix 5). Understanding of appropriate ED organizational roles are reviewed for all employees as needed, and are reviewed for new employees during induction routines (see Section 18).

4.1.2.2 Resources

All ED personnel are trained to the degree necessary or possess the skills necessary to ensure that ED products conform to stated project requirements (see Section 18). All permanent ED personnel have an Individual

Development Plan (IDP), and required training is identified on the employee's IDP. Job descriptions are reviewed annually by Supervisors.

Staff expertise includes skills necessary to perform Quality Control (QC) and Quality Assurance (QA) activities, and an understanding of the ISO standards and of the ED QMS. Management ensures that fiscal and staffing resources are adequate to perform QC and QA activities, *as required by customers*, for *all* products.

Management ensures that adequate equipment and systems (computer hardware, software and networks) are available.

The QMP's also address resources for quality management.

4.1.2.3 Management Representative and Management Team

ED's Management Representative for all quality matters, both in-house and external, is designated in the CESPK-ED MEMORANDUM: Appointments to ISO 9001 Management Team. This memorandum is also known as the "Letter of Appointments" shown in Appendix 1.

The Management Team and Project Manager for the ED QMS, functioning as the quality advocate for ED, is also designated in the Letter of Appointments.

4.1.3 Management Review

The suitability and effectiveness of the QMS is formally reviewed at least quarterly by the ISO Management Team in accordance with *EQP 1-01, Management Review*. Informal reviews are conducted as needed. The objective of the review is to examine overall performance of the QMS and to identify necessary changes.

ED participates in various meetings that address aspects of ED quality management review:

- Project Review Board (PRB) (MEMORANDUM, 22 Feb 1993, SUBJECT: Project Review Board - Military, MEMORANDUM, 2 Aug 1991, SUBJECT: District Management Plan for Civil Works, and ER 5-1-11, Program and Project Management) meetings held monthly;
- Command Management Review (CMR) (USACE Fiscal Year XX Consolidated Command Guidance) meetings held quarterly; and
- Command Assistance Program meetings (CESPK OM 20-1-1).

Informal quality management assessments are made on an ad hoc basis when necessary, using a variety of quality performance measurement tools, including customer surveys.

4.1.4 Summary of Applicable Procedures

EQP 1-01, Management Review

Section 2
Quality Management System (QMS)

Our QMS addresses specific functions and processes that affect product quality, and provides for methods of planning, implementing, documenting, monitoring, and auditing these activities. The levels of the QMS are the following:

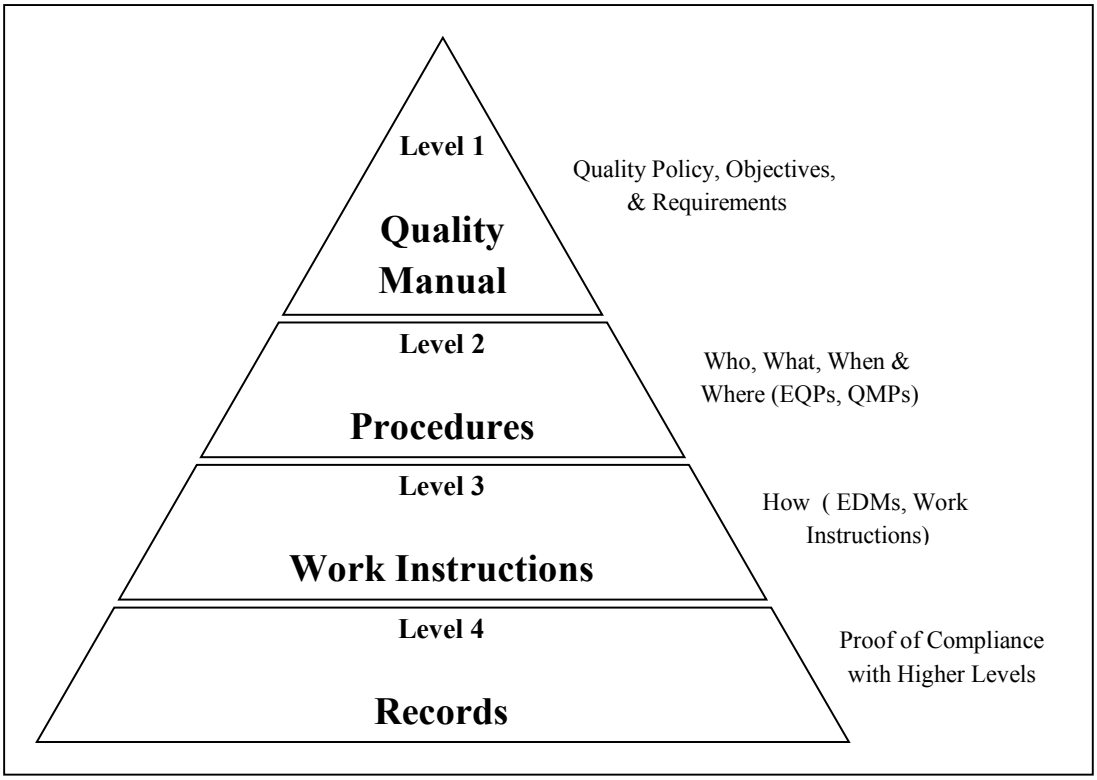
- Level 1- Policy.
- Level 2- Procedures.
- Level 3 - Work Instructions.
- Level 4 - Records.

4.2 Quality Management System (QMS)

4.2.1 General

ED has established and maintains a documented QMS so that its products conform to specified requirements. An overall quality hierarchy is shown below, which defines the ED QMS components. The ED QMS has a tiered structure, including four levels:

Engineering Division Quality Management System



Level 1 is the Quality Manual, which defines overall ED quality policy, ED policy for each of the ISO 9001 elements, and Army, USACE, Division, District, and Engineering Division policies with respect to quality and ISO 9001, and makes reference to QMS procedures.

Level 2 consists of the QMS procedures that describe the "who," "what," "when," and "where" of the system.

The QMS procedures may in turn point to work instructions at Level 3, which covers the "how to," including standard operating procedures, relevant federal legislation, Army/Engineering regulations, technical guidance, and guide specifications.

Level 4 consists of the quality records that demonstrate that Levels 1, 2, and 3 are being effectively accomplished.

The ED QMS will be used for all ED products. Deviations from this system will be rare and must be approved in writing by a member of the Management Team prior to accepting the work.

All quality-related documentation is formally controlled to avoid use of outdated guidance. The QMS documentation is electronically maintained (see Section 5, "Document and Data Control").

4.2.2 QMS Procedures

Procedures for all products/services performed by ED are contained in the *Procedures Appendix*. *EQP 5-01, Procedure for the Preparation and Administration of Procedures,* describes the development, administration, and revision requirements for the QMS procedures. Implementation training for the QMS procedures is addressed in Section 18, "Training".

4.2.3 Quality Planning

The ED Quality Management Plan (QMP), developed in accordance with USACE ER 1110-1-12, "Engineering and Design Quality Management" and CESPD R 1110-1-8, Appendix D, "Directorate of Engineering and Technical Services Quality Management Plan", is included by reference. The above USACE and Division regulations direct and define preparation of the QMP and individual Quality Control Plans (QCP). The QMP defines roles and responsibilities for quality management in ED. ED personnel develop a QCP for each engineering product or service. The QCP show how the technical, schedule, design verification, coordination, and cost requirements for the product or service will be met. QCPs are developed in accordance with USACE regulation, Division regulation, Engineering Division policy, and product-specific requirements outlined in the Project Management Plan (PMP) (see Section 4, "Design Control," and Section 9, "Process Control"). Specific QCPs define customer expectations and requirements, industry practices, applicable criteria, technical roles and responsibilities (including composition of the design and review teams), design verification, schedule and milestones, and unique, sensitive or high visibility concerns. When engineering products are developed by A-E firms, the A-E firm must develop its own QCP, and ED will develop a corresponding Quality Assurance Plan (QAP), which addresses those activities taken to ensure the overall effectiveness of the A-Es quality control process. Procedures covering the requirements of this element are found in *EQP 4-01, Design Process for Civil Works Projects; EQP 4-02, Design Process for Military Projects;* and *EQP 4-03, Design Process for HTRW Projects*. Procedures covering documentation of QCPs are found in *EQP 16-01, Management of Project Folders for Projects*.

4.2.4 Summary of Applicable Procedures

EQP 4-01, Design Process for Civil Works Projects
EQP 4-02, Design Process for Military Projects
EQP 4-03, Design Process for HTRW Projects

EQP 5-01, Procedure for the Preparation and Administration of Procedures
EQP 16-01, Management of Project Folders for Projects

Section 3
Contract Review

Our QMS requires an understanding of the customer's requirements, and addresses the ability and capability to meet those requirements. Our responsibilities include the following:

- Ensuring agreement with customers.
- Accomplishing work in conformance with requirements.
- Coordinating with all District team members.
- Conducting a review of each work request to determine our ability to accomplish the effort within established budget and schedule.

4.3 Contract Review

4.3.1 General

ED maintains documented procedures for contract review as described below.

4.3.2 Review

The appropriate Branch and Section Chiefs review Each inquiry or request to supply services as outlined in *EQP 3-01, Contract Review*.

4.3.3 Amendment to Contract

In the event that ED or the customer should seek to vary the contract conditions or requirements, revisions as agreed to by the customer and the ED design elements involved will be made to the project scope following *EQP 3-01, Contract Review*.

4.3.4 Records

Formal records of all contract review activities are maintained as outlined in *EQP 3-01, Contract Review*.

Section 4
Design Control

Our QMS requires that we:

- Develop, plan and schedule overall design efforts.
- Develop a design budget.
- Allocate resources.
- Maintain liaison between different entities that input to the product design.
- Review, identify, and verify the design requirements.
- Validate design upon completion.
- Control all design changes or modifications

4.4 Design Control

4.4.1 General

Engineering Division maintains a QMP to define the procedures for developing quality engineering products and providing quality-engineering service. In addition, to ensure that specified requirements are met, ED maintains procedural documentation, Engineering Division Memorandums (EDM), to control and verify the design and development functions for its deliverables.

4.4.2 Design and Development Planning

A QCP and QAP (consistent with the QMP) is developed for every project accepted by ED involving design and development activity. A QAP is developed for every activity that is further contracted out to an A-E Consulting Firm for execution. Specific qualified staff is assigned to each activity, and the estimated resources are identified for both personnel and equipment. Design development documents are continually updated as the design evolves. Every QCP developed requires SPD approval. Specific guidance controlling these aspects is governed by *EQP 4-01 Design Process for Civil Works Projects*; *EQP 4-02*, *Design Process for Military Projects; EQP 4-03, Design Process for HTRW Projects; EQP 4-04, Cost Engineering Process; EQP 4-05, Value Engineering;* and *EQP 19-05, Dam Safety Assurance*.

4.4.3 Organizational and Technical Interfaces

The organizational and technical interfaces having input to the process are identified within the PMP or the Project Study Plan (PSP) and the QCP. As required by these plans, regular meetings ensure that all necessary information is reviewed. Minutes of these meetings are maintained, including all meetings with the client. Specific activities are covered by *EQP 4-01*, *Design Process for Civil Works Projects*; *EQP 4-02*, *Design Process for Military Projects*; *EQP 4-03, Design Process for HTRW Projects*; *EQP 4-04, Cost Engineering Process; EQP 4-05, Value Engineering;* and *EQP 3-01, Contract Review*.

4.4.4 Design Input

All design input is documented within the activity, and includes relevant statutory and regulatory requirements. The review process ensures that such inputs are adequate for the requirements of the design process. Any incomplete or ambiguous requirements are identified in the minutes of review meetings and resolved with the appropriate parties

before the design activities proceed. Contract review is considered an integral and essential part of this activity. Specific activities are covered by *EQP 4-01, Design Process for Civil Works Projects; EQP 4-02, Design Process for Military Projects; EQP 4-03 Design Process for HTRW Projects; EQP 6-01, Purchasing of Services;* and *EQP 3-01, Contract Review.*

4.4.5 Design Output

The output from each stage of the design process is documented as part of the design review activity and is stated in terms of measurable requirements. The design output will comply with input requirements; specify acceptable criteria; and identify any areas requiring special considerations such as operating, storage, handling, maintenance, and disposal requirements. The construction considerations are passed on through the document titled "Engineering Considerations and Instruction to Field Personnel." All such activities are conducted in accordance with *EQP 4-01, Design Process for Civil Works Projects*; *EQP 4-02, Design Process for Military Projects; EQP 4-03, Design Process for HTRW Projects;* and *EQP 4-04, Cost Engineering Process; EQP 16-04, Management of Records (General).*

4.4.6 Design Review

The QCP for each product identifies appropriate review stages for that product, and meetings involving all relevant personnel are held as required to ensure that the design and development activity is proceeding in an appropriate manner. Records of all design reviews are maintained. All such activities are conducted in accordance with *EQP 4-01, Design Process for Civil Works Projects; EQP 4-02, Design Process for Military Projects; EQP 4-03, Design Process for HTRW Projects; EQP 4-04, Cost Engineering Process; EQP 4-05, Value Engineering;* and *EQP 13-01, Control and Correction of Nonconforming Product.*

4.4.7 Design Verification

Each stage of the development activity is subject to verification activities, which form part of the design review. Design verification is performed in accordance with the QCP and ensures compliance with all applicable criteria. Required activities of this element are covered in *EQP 4-01, Design Process for Civil Works Projects*; *EQP 4-02, Design Process for Military Projects*; *EQP 4-03, Design Process for HTRW Projects; EQP 4-04, Cost Engineering Process;* and *EQP 13-01, Control and Correction of Nonconforming Product; EQP 16-04, Management of Records (General).* The verification process may include, but is not limited to, the following:

a. Major assumption and calculation checks by peers or senior personnel
b. Designer/Reviewer consultations
c. Performing alternative calculations
d. Comparing new design against a similar proven design
e. Conducting physical model studies
f. Utilizing recognized experts and/or consultants.

4.4.8 Design Validation

For construction projects, at the 90% design stage or at the conclusion of the design activity, but prior to construction advertisement, a plan-in-hand site inspection shall be conducted. The results of this validation process are compared to the original design input requirements to ensure that the output from the design process meets the original intent of the customer and is consistent with on the ground existing features. Required activities of this element are covered in *EQP 4-01, Design Process for Civil Works Projects; EQP 4-02, Design Process for Military Projects; EQP 4-03, Design Process for HTRW Projects;* and *EQP 13-01, Control and Correction of Nonconforming Product*

4.4.9 Design Changes

Design change control is exercised from that stage of any project when the original designer of the product releases the design to other team members for evaluation or integration. All deliverables regardless of the stage of design (10%, preliminary, 30%, 60%, 90%, etc.) shall clearly depict the stage of design on the documents. All design documents (reports, memorandums, design analysis, drawings, and specifications) shall contain the name/signature of the designer, checker, and the Project Engineer (PE). All design changes and modifications shall be identified on the design documents with the date implemented, a brief description of the change, and signature approval by the authorized personnel. The customer and design team shall receive design changes prior to implementation. Records of these reviews are maintained in accordance with paragraph 4.4.6, Design Review.

4.4.10 Summary of Applicable Procedures

EQP 3-01, Contract Review
EQP 4-01, Design Process for Civil Works Projects
EQP 4-02, Design Process for Military Projects
EQP 4-03, Design Process for HTRW Projects
EQP 4-04, Cost Engineering Process
EQP 4-05, Value Engineering
EQP 6-01, Purchasing of Services
EQP 13-01, Control and Correction of Nonconforming Product

Section 5
Document and Data Control

Our QMS directs us to approve, issue, circulate and revise documents and data under controlled conditions. Documents and data may become records when they are no longer subject to change. All obsolete documents may be retained as records for legal or knowledge preservation purposes.

Specific documents and data include the following:

- Customer requirements and requests for work.
- Quality Manual, technical guidance/criteria, and work instructions (SOP).
- Engineering products, such as Design Memorandums and reports, HTRW reports, and Plans and Specifications.

4.5 Document and Data Control

4.5.1 General

The following documents and data in ED are all subject to document control procedures and are maintained by the organization indicated:

Documents or Data	Responsible Office	EQP
Procedures for the Preparation and Administration of QMS Manual and Procedures	ED	5-01
ED Quality Manual and Procedures	ED	5-03
Higher Authority Regulations	IM (official), ED	5-05
Engineering Division Memoranda (EDMs)	ED	5-05
Civil Works design memoranda, design analyses, plans and specs	Civil Des Br	5-02
Military design analyses, plans, and specs	Mil Des Br	5-02
HTRW work plans, design analyses, plans and specs	Envr Engr Br	5-02
Civil Works Projects Operation and Maintenance manuals	Civil Des Br	5-03
Guide Specifications	ET&S	5-04
Industry Standards, Reference Standards	ET&S	5-05
Surveys	Geotechnical Br	16-03
Logs of Borings	Geotechnical Br	16-03

4.5.2 Document and Data Approval and Issue

The ED Quality Manual and all EQPs are authorized, approved and revised in accordance with *EQP 5-01, Procedure for the Preparation and Administration of Procedures*.

All other controlled documents developed by ED are reviewed, approved, and issued under the supervision of the organization indicated above. Currency of controlled documents is maintained by the organization indicated. Documents on the LAN are controlled electronically, and guidance from higher authority is maintained by hard copy in ED. Obsolete hard copy documents are removed from files. All personnel have access to pertinent documents through the district LAN or through ED files. Outdated documents may be retained for reference purposes.

4.5.3 Document and Data Changes

Changes to the ED Quality Manual and EQPs are performed in accordance with *EQP 5-01, Procedure for Preparation and Administration of Procedures.*

Changes to other controlled documents will be accomplished in a similar manner except authority and approval is delegated to the chief of the relevant organization indicated. Maintenance and distribution shall also be handled in identical manner with *EQP 5-01, Procedures for the Preparation and Administration of Procedures*.

Interim or handwritten changes are not permitted.

4.5.4 Summary of Applicable Procedures

EQP 5-01, Procedure for the Preparation and Administration of Procedures.

Section 6
Purchasing

Our QMS requires that the purchase and procurement of materials and services conform to specified requirements. Purchases are authorized, prepared, reviewed, and verified in accordance with guidance.

4.6 Purchasing

4.6.1 General

As described below, ED maintains documented procedures to ensure that purchased products conform to specified requirements.

4.6.2 Evaluation of Subcontractors

All subcontractors for all design-related services are selected through an evaluation process to determine the most qualified firms based on ability and other quality-related factors. Appropriate levels of control over the subcontractor are fully described in the QAP and the contract scope of work. The requirements of this element are covered by *EQP 6-01, Purchasing of Services.*

4.6.3 Purchasing Data

The contracts for services detail fully the product or service required, including references to standards and codes where applicable. All such documents are reviewed for completeness of specified requirements prior to issue. *EQP 6-01, Purchasing of Services*, addresses these requirements.

4.6.4 Verification of Purchased Product

4.6.4.1 ED Verification.

ED verification shall be accomplished in accordance with the project QAP. Many times this may be performed at the subcontractor's premises.

4.6.4.2 Customer Verification.

The customer is always permitted to verify the product at ED's premises or at the subcontractor's premises. The customer is not allowed, however, to modify the contract by directly dealing with the subcontractor. A contract change will always be the responsibility of the PE to coordinate with the Contracting Officer or his representative. Although the customer is permitted to conduct verifications, as deemed appropriate, ED maintains full responsibility to ensure that an acceptable product is provided. This responsibility can never be assumed to pass to the customer. Irrespective of any prior customer verifications, the customer maintains the right to subsequently reject any product deemed as nonconforming to its properly defined requirements established in Section 3, "Contract Review".

4.6.5 Summary of Applicable Procedures

EQP 6-01, Purchasing of Services

EQP 13-01, Control and Correction of Nonconforming Product

Section 7
Control of Customer-Supplied Product

Our QMS addresses Customer Supplied Products as materials, documents, or data that a customer provides for use during product development.

Customer Supplied Products are inspected upon receipt from the customer and are handled, stored, and maintained as appropriate for the type product supplied. Lost, damaged, nonconforming, defective, or unserviceable products are reported to the customer.

4.7 Control of Customer-Supplied Product

The control, verification, storage, and maintenance of customer-supplied products shall be accomplished in accordance with *EQP 7-01, Control of Customer-Supplied Product*. Instructions for dealing with lost or damaged customer-supplied product are also covered in that procedure.

4.7.1 Summary of Applicable Procedures

EQP 7-01, Control of Customer-Supplied Product

Section 8
Product Identification and Traceability

Our QMS provides for the identification and traceability of a product. Project-unique products shall be identified and be traceable from source to end-use. (e.g.: Marks, Drawing File and Specification numbers). Finished products shall be identified to provide traceability and prevent misplacement.

4.8 Product Identification and Traceability

The identification and traceability of work in process and finished product is accomplished in accordance with *EQP 4-01, Design Process for Civil Works Projects*; *EQP 4-02, Design Process for Military Projects*; *EQP 4-03, Design Process for HTRW Projects*; and *EQP 05-03, Control of Military Project Documents*.

4.8.1 Summary of Applicable Procedures

EQP 4-01, Design Process for Civil Works Projects
EQP 4-02, Design Process for Military Projects
EQP 4-03, Design Process for HTRW Projects
EQP 5-02, Control of Project Documents

Section 9
Process Control

Our QMS directs through QMP that all work in Engineering Division is planned, scheduled, budgeted, and defined by means of implementing a QCP for a specific customer request.

The QCP provides criteria for acceptability, establishes monitoring and control points, and references standards, codes, and regulations.

Where the customer's requirements differ from Engineering Division procedures, the customer's procedures shall be referenced by the customer request and shall supersede internal processes.

4.9 Process Control

All ED activities are governed by documented procedures. The work is controlled by means of documented instructions and records of work performed are maintained. ED provides continuous monitoring and control of process parameters to ensure that specified requirements are met. Design processes are carried out in a manner that can be fully verified by subsequent inspection or testing. Also see Section 4, paragraph 4.4, "Design Control". *EQP 4-01, Design Process for Civil Works Projects*; *EQP 4-02, Design Process for Military Projects*; *and EQP 4-03, Design Process for HTRW Projects* govern activities of this element. For purposes of this element, "installation" is would be better interpreted as "delivery," and "servicing" would be equivalent to providing E&D assistance during construction activities.

4.9.1 Summary of Applicable Procedures

EQP 4-01, Design Process for Civil Works Projects
EQP 4-02, Design Process for Military Projects
EQP 4-03, Design Process for HTRW Projects

Section 10
Inspection and Testing

Our QMS requires review of incoming materials, inspection and testing at critical stages of production, and final inspection prior to delivery.

In-process reviews are performed during project development to ensure the product conforms to the specified requirements.

Final inspections and tests are facilitated through the use of the Automated Review Management System (ARMS) to determine if the product satisfies the specific requirements.

4.10 Inspection and Testing

4.10.1 General

Since the primary responsibility of Engineering Division is design development, the design review and verification provisions of Section 4, paragraph 4.4, "Design Control", and Section 13, paragraph 4.13, "Control of Nonconforming Product", cover this requirement. Specific procedures that address this element are *EQP 4-01, Design Process for Civil Works Projects; EQP 4-02, Design Process for Military Projects; EQP 4-03, Design Process for HTRW Projects;* and *EQP 13-01, Control and Correction of Nonconforming Product*. The QCP developed for each product specifically details inspection, testing, and records requirements.

4.10.2 Receiving Inspection and Testing

It is ED policy to inspect and verify conformance with specified requirements before an incoming product, such as an A-E design service, is used. PM, with input from ED technical design specialists, shall determine if purchased design services conform to contract requirements. ED branch chiefs shall approve subcontractor products before further usage. Products received shall be clearly and uniquely identified, and logged as received passed inspection or rejected. In the event of disaster, natural emergency, or some other urgency, thorough inspection or verification may be waived or postponed; however, the incoming product will be positively identified and recorded (to facilitate subsequent inspection and conformance verification).

The requirements of this element are addressed by *EQP 4-01, Design Process for Civil Works Projects*; *EQP 4-02, Design Process for Military Projects*; *EQP 4-03, Design Process for HTRW Projects*; and *EQP 13-01, Control and Correction of Nonconforming Product*.

4.10.3 In-Process Inspection and Testing

All work is reviewed in accordance with the *EQP 4-01, Design Process for Civil Works Projects; EQP 4-02, Design Process for Military Projects*; *EQP 4-03, Design Process for HTRW Projects*; *and EQP 13-01, Control and Correction of Nonconforming Product*. The reviews occur at the appropriate milestone points as documented in the A-E contract. The inspection requirements of this element are addressed in Section 4, paragraph 4.4, "Design Control", and Section 13, paragraph 4.13, "Control of Nonconforming Product."

4.10.4 Final Inspection and Testing

All work is reviewed for conformity at contract completion. Inspection requirements of this element are addressed in Section 4, paragraph 4.4, "Design Control", and Section 13, paragraph 4.13, "Control of Nonconforming Product." The Chief of Engineering Division signature on the Biddability, Constructibility, Operability and Environmental Review (BCOE) certification and District Engineer's Quality Control Certification confirm compliance with all requirements of the QCP. Specific procedures addressing this element are *EQP 4-01, Design Process for Civil Works Projects; EQP 4-02, Design Process for Military Projects*; *EQP 4-03, Design Process for HTRW Projects;* and *EQP 13-01, Control and Correction of Nonconforming Product*.

4.10.5 Inspection and Test Records

Records of all review comments and their resolutions are maintained. The records must clearly indicate whether the product has passed or failed the acceptance criteria defined in the QCP. Preferred method for storing records of review comments will be electronically through the use of ARMS, although hard copy is allowed. Minutes are produced for all review conferences and follow-up actions required are documented. Procedures for control of these records are covered by *EQP 4-01, Design Process for Civil Works Projects; EQP 4-02, Design Process for Military Projects; EQP 4-03, Design Process for HTRW Projects; EQP 16-01, Management of Project Folders for Projects;* and *EQP 16-03, Control of Survey Records.*

The release of nonconforming products shall not occur except as noted in Section 13, paragraph 4.13.2 (and as addressed by *EQP 13-01, Control and Correction of Nonconforming Product*).

4.10.6 Summary of Applicable Procedures

EQP 4-01, Design Process for Civil Works Projects
EQP 4-02, Design Process for Military Projects
EQP 4-03, Design Process for HTRW Projects
EQP 13-01, Control and Correction of Nonconforming Product
EQP 16-01, Management of Project Folders for Projects
EQP 16-03, Control of Survey Records

Section 11
Control of Inspection, Measuring, and Test Equipment

Our QMS calls for the calibration and maintenance of measuring and test equipment used for inspection, measurement or testing purposes.

Measuring and test equipment, including special tools developed for inspection purposes, shall be calibrated, maintained and inspected. All such equipment is used in a manner that ensures that the measurement uncertainty is known and is consistent with the required capability.

Computer-based software used to determine dimensions, dimensional accuracy, or used as a basis to determine acceptability of a product shall be inspected, checked and verified at prescribed intervals.

4.11 Control of Inspection, Measuring, and Test Equipment

4.11.1 General

ED maintains procedures to control, calibrate, and maintain inspection, measuring, and test equipment (including test software) used during engineering and design. All equipment requiring control is identified, and records are kept to demonstrate item identity, storage requirements, frequency of calibration, standards to be used, calibrations carried out, remedial actions and state of accuracy prior to and after calibration. All such equipment is used in a manner that ensures that the measurement uncertainty is known and is consistent with the required measurement capability. The documented procedures also establish the extent and frequency of checks and specify the maintenance of records as evidence of control. All records are available to the customer.

4.11.2 Control Procedures

Control and calibration of instrumentation and calibration standards are in accordance with the requirements of *EQP 11-01, Calibration of Equipment*

4.11.3 Summary of Applicable Procedures

EQP 11-01, Calibration of Equipment

Section 12
Inspection and Test Status

Our QMS directs that the requirements for and results of tests and inspections be identified to assure that only conforming products are used for further processing or delivery.

4.12 Inspection and Test Status

The ARMS will be the preferred system to track status of reviews. Status of design reviews and verification will be documented in accordance with procedures in Section 8, paragraph 4.8 "Product Identification and Traceability." Final documents ready for advertisement shall contain appropriate title blocks, signature blocks, and signatures in accordance with *EQP 4-01*, *Design Process for Civil Works Projects; EQP 4-02*, *Design Process for Military Projects;* and *EQP 4-03, Design Process for HTRW Projects*.

4.12.1 Summary of Applicable Procedures

EQP 4-01, Design Process for Civil Works Projects
EQP 4-02, Design Process for Military Projects
EQP 4-03, Design Process for HTRW Projects

Section 13
Control of Nonconforming Product

Our QMS addresses identification, documentation, evaluation, segregation, and disposition of nonconforming materials, services, or products to prevent their use. Within Engineering Division, nonconforming products are generally limited to the design process. These can occur as design errors, incorrect data collection, erroneous assumptions, use of inappropriate criteria, or incorrect project scoping.

The nonconforming product may be used as is, reworked/repaired, redirected, or repurchased/replaced. If a decision is made to accept a nonconforming product, this decision shall be reported to the customer, and a description of the product shall be recorded to denote the actual condition.

Nonconformance in material or equipment received from any supply source shall be returned. Reworked or repaired items shall be re-inspected to verify conformance.

4.13 Control of Nonconforming Product

4.13.1 General

Within ED, nonconforming products are generally limited to elements of the design process. These can occur as design errors, incorrect data collection, erroneous assumptions, use of inappropriate criteria, or incorrect project scoping. ED has incorporated procedures to identify, document, evaluate, and control such occurrences to ensure that faulty designs and other products never reach the customer. Documentation in the form of comments highlighting nonconformities is provided to all relevant parties.

4.13.2 Review and Disposition of Nonconforming Product

Follow procedures of *EQP 13-01, Control and Correction of Nonconforming Product* to ensure that nonconforming products are identified and corrected before proceeding. If a decision is made to accept a nonconforming product, this decision shall be reported for concession to the customer, and a description of the nonconformity shall be recorded to denote the actual condition.

4.13.3 Summary of Applicable Procedures

EQP 13-01, Control and Correction of Nonconforming Product

Section 14
Corrective and Preventive Action

Our QMS provides for the identification, documentation, investigation, and implementation of corrective and preventive measures, including following up inspections to ensure effectiveness.

Corrective action involves the investigation and documentation of the cause(s) of customer complaints and nonconforming product, determination and implementation of corrective action needed and follow-up monitoring/auditing. Preventive action includes monitoring of work processes, reviews/analysis of tests, inspection data, and audit results to prevent nonconforming products.

4.14 Corrective and Preventive Action

4.14.1 General

ED maintains several systems aimed at correcting the causes of nonconformities. Those systems include Lessons Learned, EIRS Bulletins, SPECSINTACT, and the Automated Review Management System (ARMS). In addition, ED's design development procedures require several actions to prevent nonconformities. *EQP 4-01, Design Process for Civil Works Projects; EQP 4-02, Design Process for Military Projects; and EQP 4-03, Design Process for HTRW Projects* cover those procedures.

4.14.2 Corrective Action

The processes identified in *EQP 13-01, Control and Correction of Nonconforming Product*, will be implemented for development of all ED deliverables. These procedures encompass numerous areas of concern, including customer concerns, identification of corrective action, follow-up to confirm that corrective action was taken, and continual oversight of quality control procedures ensuring appropriateness and compliance with these procedures.

4.14.3 Preventative Action

ED maintains documented procedures that require development of a QAP to ensure that an In-House and/or subcontractor's QCP is appropriate, that audit oversight of the QCP occurs, that potential problem areas are identified, and that these findings are documented and disseminated to all appropriate personnel. ED shall implement the processes identified in *EQP 14-01, Corrective and Preventive Action*; *EQP 14-02, Lessons Learned Program for Civil Works Projects*; *EQP 14-03, Lessons Learned Program for Military Projects; EQP 14-04, Lessons Learned Program for HTRW Projects;* and *EQP 14-05, Architect/Engineer Responsibility Management Program* for development of all ED deliverables.

4.14.4 Summary of Applicable Procedures

EQP 4-01, Design Process for Civil Works Projects
EQP 4-02, Design Process for Military Projects
EQP 4-03, Design Process for HTRW Projects
EQP 13-01, Control and Correction of Nonconforming Product
EQP 14-01, Corrective and Preventive Action
EQP 14-02, Lessons Learned Program for Civil Works Projects
EQP 14-03, Lessons Learned Program for Military Projects

EQP 14-04, Lessons Learned Program for HTRW Projects
EQP 14-05, Architect/Engineer Responsibility Management Program.

Section 15
Handling, Storage, Packaging, Preservation, and Delivery

Our QMS provides for the handling, storage, packaging, and transporting of products within Engineering Division control to prevent damage or undue deterioration.

Materials that have been stored for an extended duration shall be visually inspected for signs of damage or deterioration prior to use.

4.15 Handling, Storage, Packaging, Preservation, and Delivery

ED maintains documented procedures to control handling, packaging, delivery, preservation, and storage of all ED products. These requirements are covered under Section 5, paragraph 4.5 "Document and Data Control", and Section 16, paragraph 4.16 "Control of Quality Records". Specific procedures addressing this element are:

EQP 5-01, Procedure for the Preparation and Administration of Procedures
EQP 5-02, Control of Project Documents
EQP 5-03, Control of Operation and Maintenance Manuals
EQP 5-05, Management of Regulations and Other Guidance
EQP 16-01, Management of Project Folders for Projects
EQP 16-02, Management of As-Built Drawings
EQP 16-03, Control of Survey Records
EQP 16-04, Management of Records (General)

4.15.1 Summary of Applicable Procedures

EQP 5-01, Procedure for the Preparation and Administration of Procedures
EQP 5-02, Control of Project Documents
EQP 5-03, Control of Operation and Maintenance Manuals
EQP 5-05, Management of Regulations and Other Guidance
EQP 16-01, Management of Project Folders for Projects
EQP 16-02, Management of As-Built Drawings
EQP 16-03, Control of Survey Records
EQP 16-04, Management of Records (General)

Section 16
Quality Records

Our QMS provides for storage, maintenance, and retrieval of quality records. Quality records may consist of either hard copy or electronic stored data and may include memos, inspection reports, audit reports, corrective action requests, specification reviews, meeting minutes, material or product certifications, As-Built drawings, final design documents, etc.

4.16 Control of Quality Records

ED maintains documented procedures to identify, collect, index, file, maintain, store, access and dispose of quality records. Records are always available for the customer's review. Requirements of this element are covered by the following procedures:

EQP 16-01, Management of Project Folders for Projects
EQP 16-02, Management of As-Built Drawings
EQP 16-04, Management of Records (General)

Copies of records are distributed to other offices (Library of Congress, WES Library, et cetera) as governed by regulation. Retention times are determined in MARKS (with IMO) or by regulation. MARKS and regulations govern records disposal.

4.16.1 Summary of Applicable Procedures

EQP 16-01, Management of Project Folders for Projects
EQP 16-02, Management of As-Built Drawings
EQP 16-04, Management of Records (General)

Section 17
Internal Quality Audits

Our QMS provides for the planning, scheduling, implementation, and documentation of internal audits to ensure quality-related activities comply with written procedures.

Each functional unit shall be audited on a periodic basis. Internal auditors shall not audit their own functional unit.

Internal audit results include a statement as to the effective application of the QMS, and possible suggestions of what corrective/preventive actions are needed.

When nonconforming conditions are found, a corrective action plan shall be developed and implemented. Special Follow-up audits shall be scheduled to ensure the corrective/preventive action was implemented and effective.

4.17 Internal Quality Audits

To verify that quality activities and related results comply with planned arrangements and to determine the effectiveness of the QMS, ED maintains a documented procedure for conducting internal audits. This procedure specifies the schedule and ensures that independent personnel conduct the audit, results are recorded, timely corrective action is taken, and appropriate follow-up audits are conducted to verify compliance. Detailed procedures are contained in *EQP 17-01, Internal Quality Audits*.

4.17.1 Summary of Applicable Procedures

EQP 17-01, Internal Quality Audits

Section 18
Training

Our QMS requires the identification of employee training and qualification needs. Management is responsible for ensuring that the qualifications of employees are appropriate for all tasks affecting quality.

Positions and job functions have documented training, certification, and qualification requirements. Individual Development Plans are prepared for all employees.

4.18 Training

ED Management is responsible for ensuring that the qualifications of employees under their supervision are appropriate for all assigned tasks and resulting quality. Individual Development Plan (IDP) is established for each team member on an ongoing basis and is updated at least annually. ED personnel are scheduled to take part in a variety of quality related training programs, including formal classes and seminars, long term training, and developmental assignments. Training on the ED QMS is conducted annually by supervisors and managers, for all ED team members. Employees and supervisors maintain training records as appropriate and necessary. Training procedures are described in *EQP 18-01, Training*.

4.18.1 Summary of Applicable Procedures

EQP 18-01, Training

Section 19
Servicing

Our QMS requires the establishment and maintenance of procedures specific to performing and verifying that servicing work appropriately meets customer needs. Typical servicing work includes support provided through Engineering During Construction, site visits, periodic inspections, hydro monitoring, Water Management, and Project Operation.

4.19 Servicing

Engineering Division maintains procedures for providing post-design services appropriate to the needs of our customers. Requirements of this element are addressed by the following procedures:

EQP 19-01, Inspections of Reservoir and Navigation Projects
EQP 19-02, Inspections of Bridges
EQP 19-03, Instrumentation Data Review
EQP 19-04, Dam Safety Training
EQP 19-05, Dam Safety Assurance Program
EQP 19-06, Water Management and Project Operation

4.19.1 Summary of Applicable Procedures

EQP 19-01, Inspections of Reservoir and Navigation Projects
EQP 19-02, Inspections of Bridges
EQP 19-03, Instrumentation Data Review
EQP 19-04, Dam Safety Training
EQP 19-05, Dam Safety Assurance Program
EQP 19-06, Water Management and Project Operation

Section 20
Statistical Techniques

Our QMS provides for the use of statistical techniques to confirm process and product acceptability, and to provide a basis for continuous improvement. We use statistical techniques for monitoring customer satisfaction, assessing trends, and measuring overall performance.

4.20 Statistical Techniques

ED performs statistical techniques to monitor customer satisfaction, provide overall performance indicators and assess trends. Requirements are covered by *EQP 20-01, Statistical Techniques*.

4.20.1 Summary of Applicable Procedures

EQP 20-01, Statistical Techniques